Chapter 11, part 1: Association of Quantitative Variables
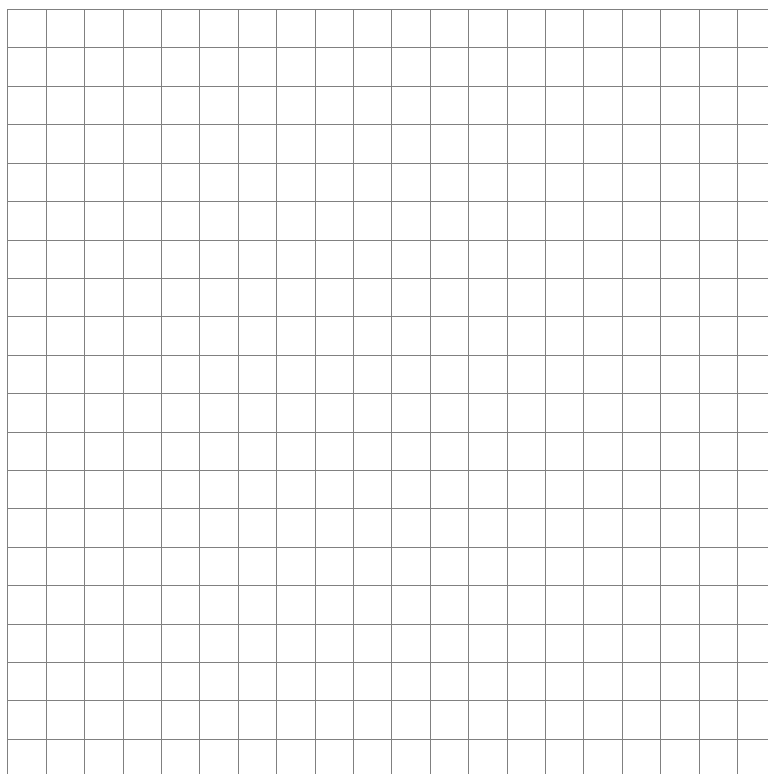
MATH 360 Homework for Pre-Service Teachers

<u>ASSIGNMENT ONE</u>

1. The regression line _____ for the five points given in the table below was computed using the method of least squares.

x	1	2	3	4	5
y	6	3	10	7	15

   A. On graph paper, plot these five points and the regression line.

   B. Using your work from part A, demonstrate the meaning of the term "least squares", i.e., why is it called the *least squares* regression line?

   C. Why is the least squares criterion appropriate for a best fit line?

2. You are leading the class in analyzing the relationship between GPA and ACT scores for a data set, using technology. You have asked your students to find the correlation coefficient, coefficient of determination, and regression line for the data set. One pair of students asks for your help. They have done their work independently and are now comparing their answers. They have the same correlation coefficient & coefficient of determination, but their regression lines are different. They are asking you for help to understand how this could be possible. What is your response? Be specific in your description of your response, writing exactly what you would say and/or drawing anything you would use in your response.

3. Martha and Barry were searching the Internet to find information on air travel in the United States. They found data on the number of commercial aircraft flying in the United States during the years 1990-1998. The dates were recorded as years since 1990. Thus, the year 1990 was recorded as year 0. They fit a least squares regression line to the data. The graph of the residuals and part of the computer output for their regression are given below.
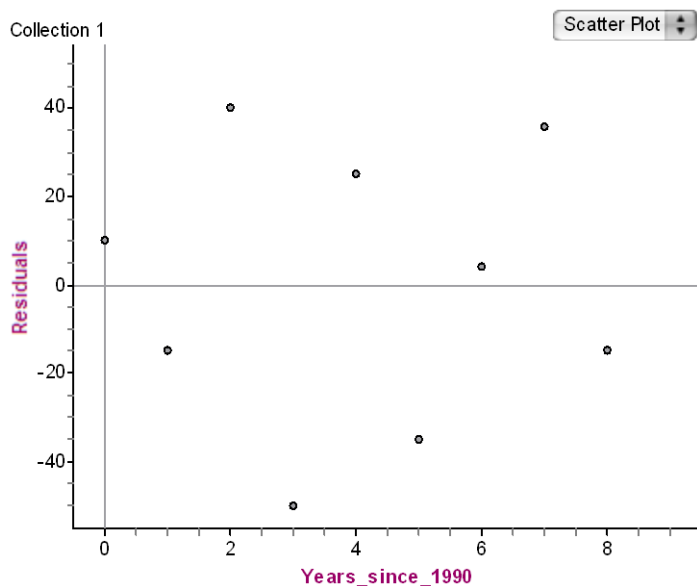
Predictor	Coef	Stdev	t-statistic	p
Constant	2939.93	20.55	143.09	0.000
Years	233.517	4.316	54.11	0.000
s=33.43				

A. Is a line an appropriate model to use for this data set? What information tells you this?

B. What is the value of the slope of the least squares regression line?
   Interpret the slope in the context of this situation.

C. What is the value of the y-intercept of the least squares regression line?
   Interpret the y-intercept in the context of this situation.

D. What was the actual number of commercial aircraft flying in 1992?

E. Explain the meaning of the t-statistic (sometimes also called a t-ratio) value of 54.11 in the computer output.

4. To start a lesson on lines of best fit, you are following the curriculum guide and have presented your students the following data set about the pounds of beans used by families of different sizes when traveling on the Overland Trail:

Number of people	5	8	6	7	11	10	5	7	10	5	8	7	9	12	10
Pounds of beans	61	95	56	75	125	135	80	100	103	75	100	105	125	150	125

The first question in the activity asks the students to discuss ways in which you could use the information in the table to decide how many pounds of beans a family with 20 people would need.

A. Mary responds first, stating "You could look at people with like 10 people in their families and just double that amount that they use."

How would you respond to this student? Be specific in your description of your response, writing exactly what you would say and/or drawing anything you would use in your response.

B. The class is convinced that Mary's strategy is the best one to take. However, the curriculum writers designed this question to be an introduction to the line of best fit, which is to be the focus of the day's lesson. What would you do in this situation? Things to address include a way to convince the students that Mary's strategy is not the best one; how to transition from this "scaling" method to the "best fit line" method; how to help the students look at the data from an aggregate view (looking at data set as a whole) as opposed to a case view (looking at one data point at a time).